EPAM Capital Markets Competency Center

Cluster Solution for FIXEdge Server

B2BITS Corporation
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OS: CentOS 5 Enterprise Linux Server

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Overview

Clustering uses specific hardware and software to join multiple systems together to function as a single system and provide an automatic failover solution. If one of the clustered systems (also known as cluster nodes, or nodes) fails, resources running on the failed system are moved (or failed over) to one or more systems in the cluster by the RedHat Cluster Suite (RHCS) software. RHCS is the failover software component in specific versions of the RedHat Enterprise Linux Server operating system.

Note: CentOS 5 Enterprise Linux is built on the Red Hat Enterprise Linux source code. Other than logo and name changes CentOS Enterprise Linux is compatible with the equivalent Red Hat version.

When the failed system is repaired and brought back online, resources automatically transfer back (or fail back) to the repaired system or remain on the failover system, depending on how RHCS is configured.

Virtual Servers and Resource Groups

In a cluster environment, it is not a physical server that is being accessed; users access a virtual server, which is managed by RHCS. Each virtual server has its own IP address, name, and hard drive(s) in the shared storage system. RHCS manages the virtual server as a resource group, which contains the cluster resources. Ownership of virtual servers and resource groups is transparent to users. See "Groups" section of the appropriate document for more information on resource groups.

When RHCS detects a failed node or failed application, RHCS moves the entire resource group to another node and remaps the virtual server to the new network connection. Users of an application ran on the virtual server experience only a momentary delay in accessing resources, while RHCS re-establishes a network connection to the virtual server and restarts the application.

Quorum Resource

A single disk, which is designated as the quorum resource, maintains the configuration data (including all the changes that have been applied to a cluster database) necessary for recovery when a node fails.

The quorum resource can be any resource with the following attributes:

- Enables a single node to gain and defend its physical control of the quorum resource
- Provides physical storage that is accessible by any node in the cluster
- Uses the Red Hat Global File System (GFS)

Shared Storage Systems

Cluster nodes can share access to external storage systems. However, only one of the nodes can own any RAID volume in the external storage system at any time. RHCS controls which node has access to each RAID volume in the shared storage system.

Cluster solution

Current cluster solution implements two-node clustering technology based on the RHCS software incorporated within the CentOS 5 Enterprise Linux Server operating system. This cluster solution provides the following benefits that meet the needs of mission-critical network application program B2Bits FIXEdge server:

- High availability of system services and resources to network clients
- Redundant storage for application related data
- Failure recovery for cluster-aware application
- Flexible maintenance capabilities, allowing you to repair, maintain, or upgrade a cluster node without taking the entire cluster offline

Each cluster node is configured with software, storage, and network resources that enable it to monitor and interact with the other node to provide mutually redundant operation. If a cluster node fails for any reason, virtual servers and resource groups are moved over to the healthy cluster node. When the failed node is repaired and brought back to work, the virtual servers and resource groups are moved back to the repaired node (if ordered so). In this manner, the cluster nodes operate as a single resource, rather than a collection of individual systems. Because of the fact that the cluster nodes interact to assure their work, virtual server appears as a single system to the network clients.

Hardware and Software Technologies

Cluster solution implements the following hardware and software technologies:

- Clustering technology based on the RHCS software in the CentOS 5 Enterprise Linux Server operating system.
- PERC 4/DC card or PERC 4e/DC card.
- Storage management software.

Clustering Technology

Clustering is the technology that allows connecting multiple servers together to achieve higher availability and performance. RHCS is a software component in CentOS 5 Enterprise Linux Server, which provides failover support for applications and services running on each node.

Cluster Components

- Two Dell 1850 PowerEdge systems in a homogeneous pair.
- One PowerVault 220S storage system with dual EMMs and split-bus module.
- Supported network adapters for a public and private LANs.
- Support for RAID 1, 5, 1+0, and 5+0 levels and hot spare drives. RAID 5 is recommended level.

NOTE: RAID 0 and independent drives are possible but are not recommended for a high-availability system because they do not offer data redundancy if a disk failure occurs.

- Two PERC 4e/DC adapters for the cluster's shared storage.
- Ethernet network adapter or integrated network adapter for node-to-node cluster communications.
- Ethernet crossover or straight cable for node-to-node cluster interconnects.

Figure 1 shows configuration of the cluster solution components and their interconnections

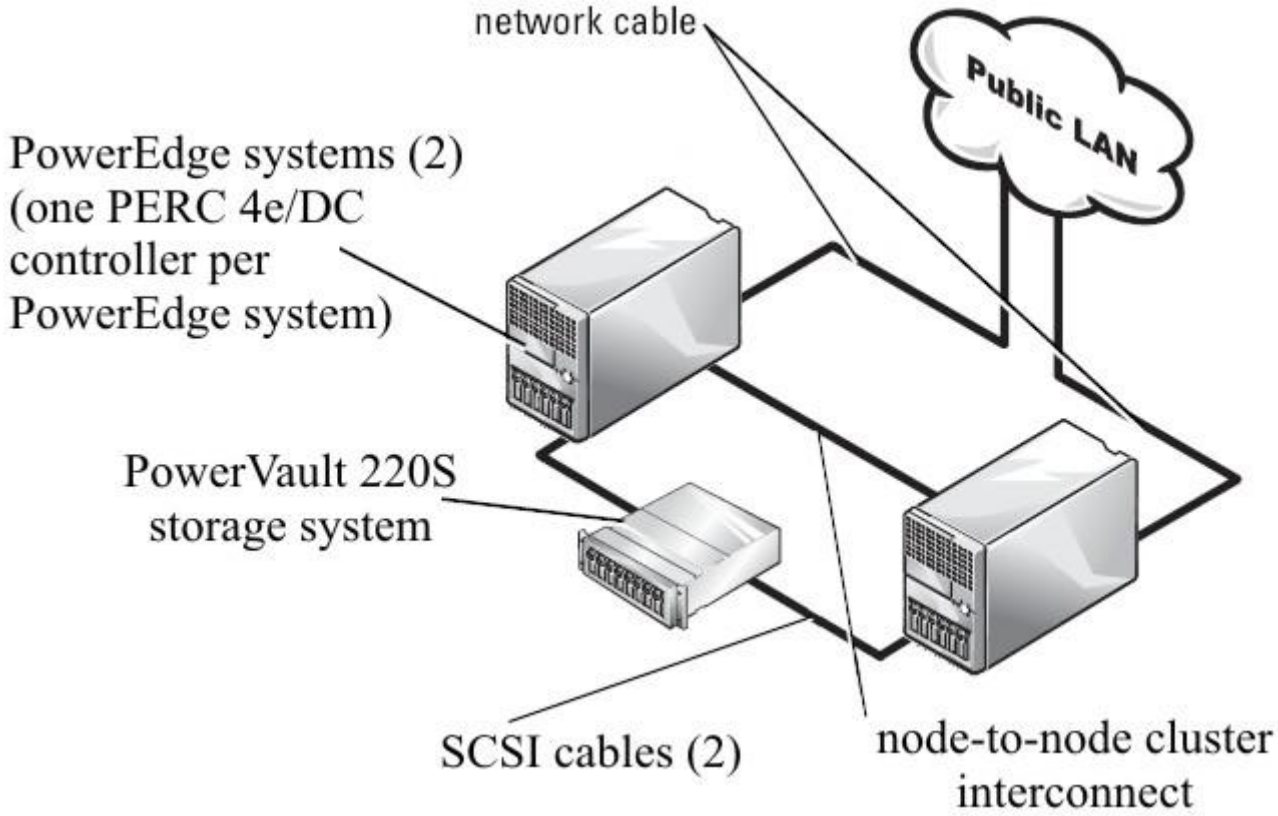


Figure 1. Configuration of cluster solution components and their interconnections.

System Requirements

Cluster solution configurations require the following hardware and software components:

- Cluster nodes
- Storage
- Interconnects (private network)
- Client network connections (public network)
- Operating system and storage management software

Cluster node Requirements

Table lists the hardware requirements for the cluster nodes

Component	Minimum requirement
Cluster nodes	Two supported PowerEdge systems running CentOS 5 Enterprise Linux Server operating system.
Processors	At least two processors for each cluster node.
RAM	At least 512 MB RAM installed on each cluster node for CentOS 5 Enterprise Linux Server.
On-board hard drive controller	For the internal drives, users can use internal SCSI adapter (default) or any RAID controller supported by the server platform. Two disk drives are required for mirroring (RAID 1) and at least three disk drives are required for disk striping with parity (RAID 5). One disk drive is needed then internal SCSI adapter is used.
Clustered RAID adapter	One PERC 4e/DC card for each cluster node.
Network adapters	Minimum of two network interfaces: one for the public network (client LAN connections) and another for the private network (cluster interconnect). The network adapters installed in each cluster node must be identical and supported by the server platform.

Cabling cluster hardware

Cluster configurations require cabling for the storage systems, cluster interconnects, client network connections, and power connections.

Cabling for the cluster Solution

Components	Description
Shared storage system	Connects the host-based, RAID controller to the disk enclosure. This interconnect is made from the PERC 4e/DC card in each PowerEdge system to the Dell PowerVault™ 220S EMMs, using Dell-qualified U320 SCSI cables.
Cluster interconnect (private network)	Connects the systems to each other to exchange information and status. This connection can be made by using a supported Ethernet network adapter and crossover cabling connected to each cluster node.
Network connection for public traffic (public network)	Provides a connection between each cluster node and the client network. This connection can be made using an Ethernet network adapter and cabling that is connected to the public network.
Power connection	Provides a connection between the power source and the power supplies in your system.

Cabling PowerVault 220S Shared Storage System to a Cluster

1) Connect the SCSI connector A (see Figure 2) on the back of the PowerVault 220S storage system to the 68-pin connector on the first SCSI cable (see Figure 3), and then tighten the retaining screws.
2) Connect the very high-density connector interface (VHDCI) connector of the first SCSI cable to the channel 0 connector on the cluster-enabled PERC RAID adapter in the first PowerEdge system (see Figure 3), and then tighten the retaining screws.

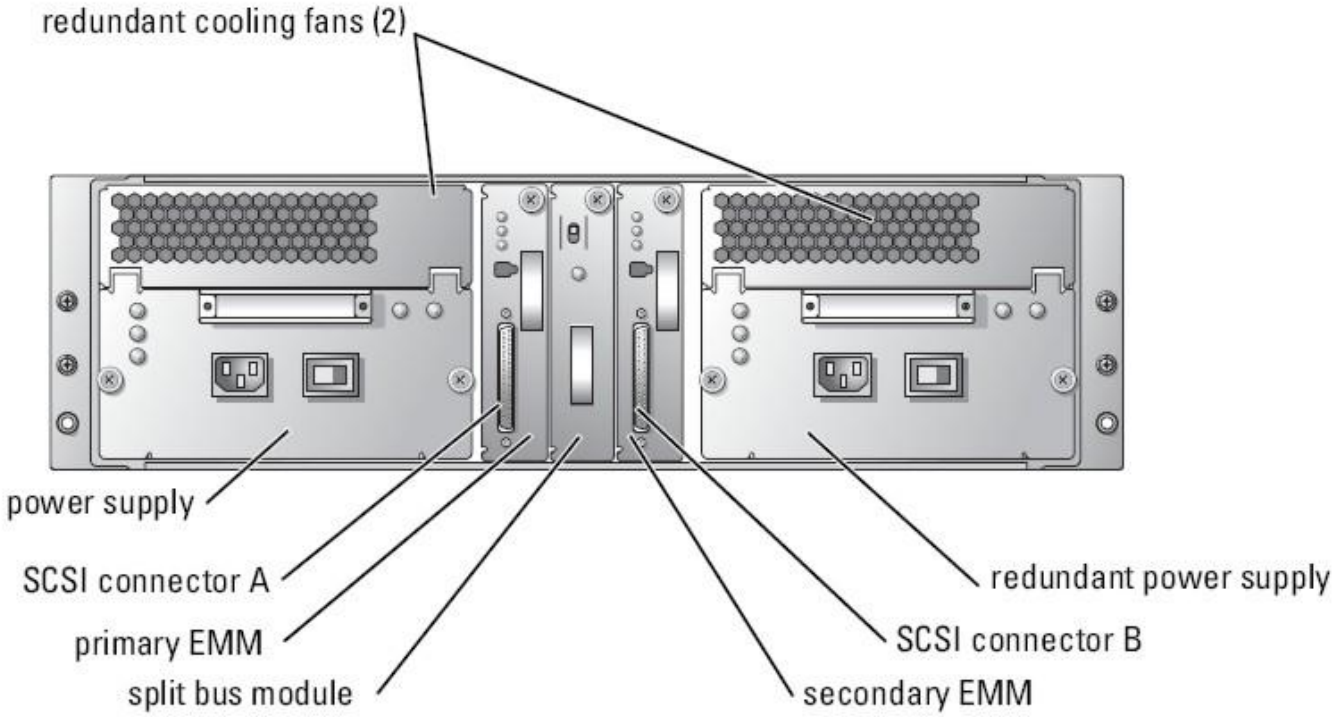


Figure 2. PowerVault 220S back panel

3) Connect the VHDCI connector of the second SCSI cable (see Figure 3) to the channel 0 connector on the cluster-enabled PERC RAID adapter in the second PowerEdge system, and then tighten the retaining screws.
4) Connect the SCSI connector B (see Figure 2) on the back of the PowerVault 220S storage system to the 68-pin connector on the second SCSI cable (see Figure 3), and tighten the retaining screws.

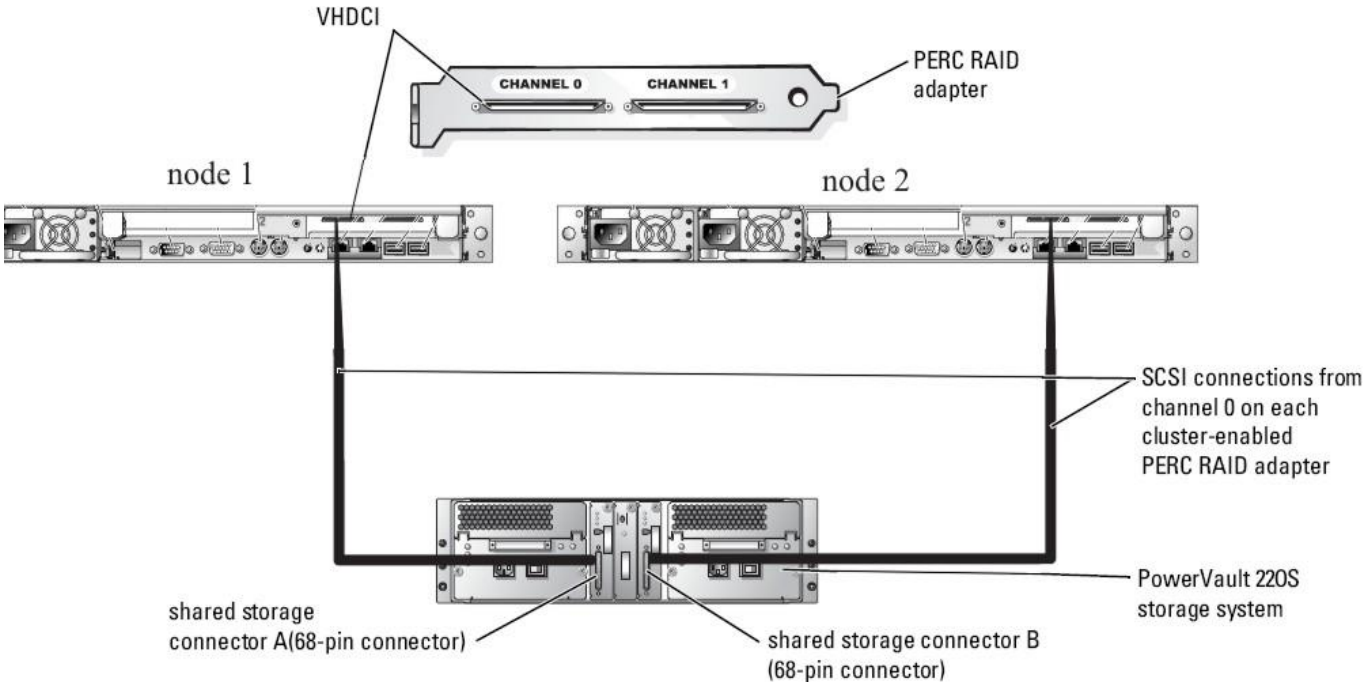


Figure 3. Cabling a Clustered System with PowerVault 220S Storage System

Cabling Public and Private Networks

The network adapters in the cluster nodes provide at least two network connections for each node.

Network connection	Description
Public network	All connections to the client LAN. At least one public network must be configured for Mixed mode for private network failover.
Private network	A dedicated connection for sharing cluster health and status information between the cluster nodes. Network adapters connected to the LAN can also provide redundancy at the communications level in case the cluster interconnect fails. See your RHCS documentation for more information on private network redundancy.

Figure 4 shows an example of network adapter cabling in which dedicated network adapters in each node are connected to the public network and the remaining network adapters are connected to each other (for the private network).

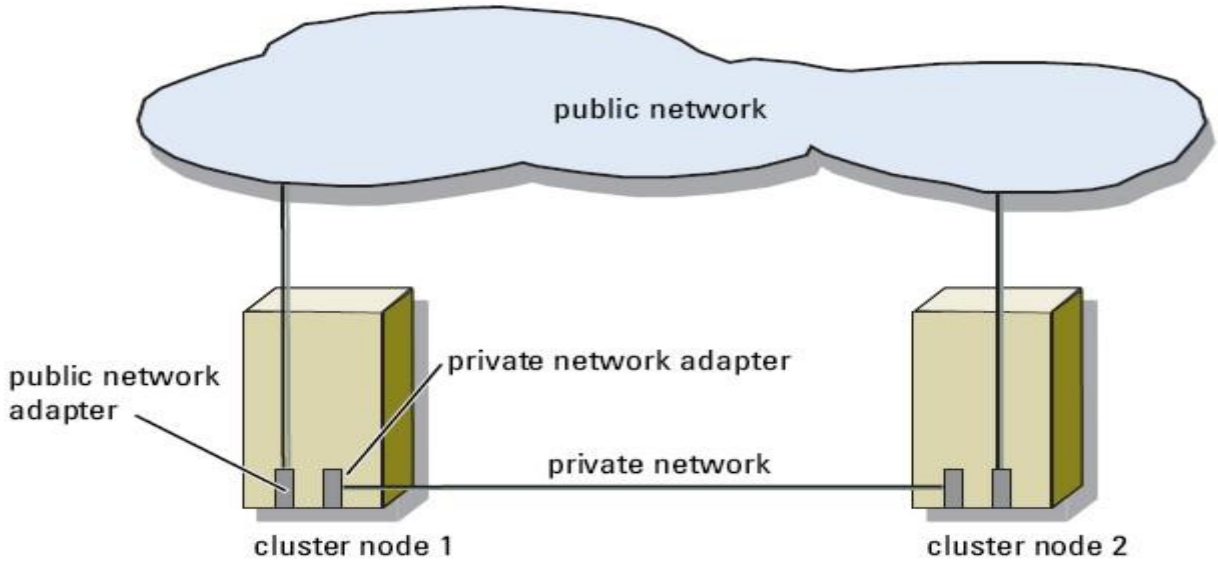


Figure 4. Network Cabling Connection

Cabling Your Private Network

The private network connection to the cluster nodes is provided by a first adapter installed in each node. This network is used for intracluster communications. Connect a crossover Ethernet cable between the Fast Ethernet network adapters in both cluster nodes. Dell 1850 PowerEdge first internal adapter is recommended.

Cabling Your Public Network

The public network connection (client network) to the cluster nodes is provided by a second network adapter that is installed in each node. Any network adapter supported by the system running TCP/IP may be used to connect to the public network segments. Dell 1850 PowerEdge second internal adapter is recommended.

Cabling the Mouse, Keyboard, and Monitor

If you are installing a cluster configuration with a KVM (Keyboard Video Mouse) rack, your cluster will require a switch box to enable the mouse, keyboard, and monitor for your cluster nodes. Otherwise connect mouse, keyboard and monitor to each cluster node.

See your rack installation documentation included with your rack for instructions on cabling each cluster node's Keyboard Video Mouse (KVM) to the mouse/keyboard/monitor switch box in the rack.

Disk drives disposition

This Cluster Solution installation guide assumes:

1. One SCSI hard disk inserted into SLOT 0.
2. Optional optical drive is present.
3. Second SCSI driver slot (SLOT 1) is empty.

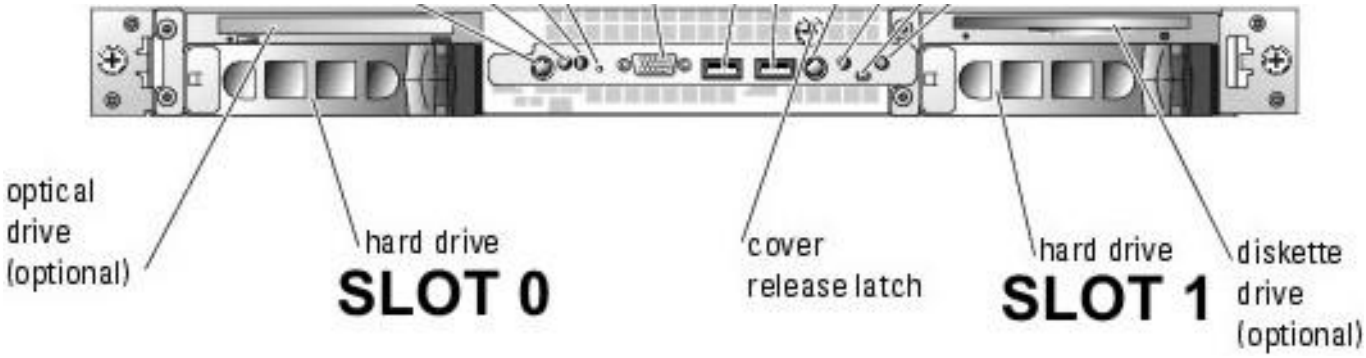


Figure 5. Dell 1850 PowerEdge frontal view

Preparing Systems for Clustering

This section provides information for preparing your server and storage system hardware for clustering in a cluster configuration.

Before You Begin

1) Ensure that your work/office site can handle the power requirements of the cluster equipment. Contact your equipment sales representative for information about your region's power requirements.

2) Ensure that the following components are installed in each Dell 1850 PowerEdge system in the cluster:
- Network adapters
- PERC RAID adapters
- One SCSI hard drive in slot 0
- Any additional peripheral components
- RAID controllers for internal drives (optional)

3) Ensure that the following components are installed on Dell PowerVault 220S system in the cluster:
- Two enclosure management modules (EMMs)
- A split-bus module
- SCSI hard drives

4) Cable the system hardware for clustering.

5) Configure the internal hard drives in your cluster nodes (in Dell 1850 PowerEdge BIOS configuration. See Appendix A-1)

6) Configure the PERC RAID adapters as described in PERC RAID adapter documentation (see Appendix A-2).

7) Configure the storage system as described in storage system documentation (see Appendix A-3).

8) Configure BMC controller for “IPMI over LAN” management as described in BMC adapter documentation (see Appendix A-4).

9) If you are using hardware-based RAID for the internal SCSI hard drives, configure the hard drives using the controller's BIOS utility.

Note: Appendix A-[1, 2, 3, 4] includes sufficient configuration parameters recommended for all Dell 1850 PowerEdge adapters.

Installation Overview

1) Ensure that your cluster meets the requirements as described in "Before You Begin."

2) Reserve static IP addresses for your cluster resources and components. The resources and components include:
- Public network
- Private network
- Cluster virtual servers

Cluster solution IP addressing

Note: change public network ip address space to current LAN IP address space. If required - change private IP network address range to avoid IP address space crossing with existent LAN IP network. Please consult with LAN system administrator to obtain comfortable IP address spaces.

Public network (example):
Network address: 192.168.10.0
Network mask: 255.255.255.0
Node 1 IP address: 192.168.10.4
Node 2 IP address: 192.168.10.5
Private network (example):
Network address: 10.0.0.0
Network mask: 255.255.255.248
Node 1 IP address: 10.0.0.1

Node 1 IPMI interface address: 10.0.0.3
Node 2 IP address: 10.0.0.2
Node 2 IPMI interface address: 10.0.0.4
Cluster virtual server:
Service virtual IP: 192.168.10.153

You will use these IP addresses when you install the CentOS 5 operating system, configure "IPMI over LAN" interfaces on Dell 1850 PowerEdge BMC baseboard setup and RHCS.

3) Install and configure the CentOS 5 Enterprise Linux Server operating system.
The CentOS 5 operating system must be installed on both of the cluster nodes.

4) Download and launch RHCS installation manager script

CentOS 5 Enterprise Linux Server installation

Note: all disk devices attached to Cluster Node systems are intended for cluster solution. Please backup all information (if any) stored on disk drives to avoid data loses. Each node installation requires local hard disk formatting. Shared storage disk device will be formatted during Cluster Node 1 installation.

1) Power on PowerVault 220S shared storage system.
2) Power on Cluster Node 1.
3) Insert into internal CD-ROM device first CD of CentOS 5 distribution

Note: make sure that Cluster Node 1 starts seeking bootable device from internal CD-ROM drive. (To make sure that this is the case, configure Dell 1850 PowerEdge BIOS setup. See Appendix A-1)

4) Start CentOS 5 installation
5) Follow installation instructions

Note: If the message "The partition table on device SDA was unreadable" appears – please select "Initialize this device, erasing ALL DATA".

Note: If the message is "The partition table on device SDB was unreadable" – please select "Initialize this device, erasing ALL DATA". Message should appear only within Cluster Node 1 installation. If message appears during Cluster Node 2 installation – it signals about wrong shared storage configuration (See Appendix A-3)

Disk partitioning

6) Detailed instruction about local hard disk partitioning:
   - Select "Create custom layout" than press "NEXT"
   - Create next partitions on disk "sda" (only "sda" checkbox must be marked while partition parameters entering). New partition creates by pressing "NEW" button.

Partition #	Mount point	FS type	Size (Megabytes)	Additional Size Options
1	/boot	ext3	75	Fixed Size, Force to be a primary partition
2	none after selecting FS type	swap	2*RAM size (for example 1024 if Cluster Node have 512 Mb of RAM)	Fixed Size
3	/var	ext3	8192	Fixed Size
4	/	ext3	8192	Fixed Size
5	/tmp	ext3	8192	Fixed Size
6	/usr	ext3	none after selecting additional size options	Fill to maximum allowable size

   - Finally disk "sda" partition table should be like

```
/dev/sda
    /dev/sda1   /boot   ext3   format_partition: yes   partition_size (MB): 78
    /dev/sda2   /tmp    ext3   format_partition: yes   partition_size (MB): 8189
    /dev/sda3   /       ext3   format_partition: yes   partition_size (MB): 8189
    /dev/sda4
        /dev/sda5   /var    ext3   format_partition: yes   partition_size (MB): 8189
        /dev/sda6   none    swap   format_partition: yes   partition_size (MB): xxx
        /dev/sda7   /usr    ext3   format_partition: yes   partition_size (MB): xxx
```

   - Press "NEXT" to save partition table to disk.

Network adapters configuration

On the corresponding installation screen, please configure network adapters using values from the table (if not specified – values are ok for both nodes). The following configuration parameters constitute an example to serve the purposes of this document. It will work only if there is no conflict with other IP addresses, netmasks and gateways in your LAN. Also, user should keep in mind that these settings will not guaranty any access to the cluster from the Internet (with all the consequences). Please consult with your LAN system administrator to obtain comfortable IP address spaces.

Name	Value
DNS local domain name	localdomain
private IP network	10.0.0.0
private IP netmask	255.255.255.248
public LAN IP network	192.168.10.0
public LAN IP netmask	255.255.255.0
public LAN default gateway	192.168.10.1
public DNS server	192.168.10.1
Cluster Node 1 private interface	Dell 1850 PowerEdge first internal network adapter (eth0)
Cluster Node 1 private static IP address	10.0.0.1
Cluster Node 1 public interface	Dell 1850 PowerEdge second internal network adapter (eth1)
Cluster Node 1 public static IP address	192.168.10.4
Cluster Node 1 hostname	node-a.localdomain
Cluster Node 2 private interface	Dell 1850 PowerEdge first internal network adapter (eth0)
Cluster Node 2 private static IP address	10.0.0.2
Cluster Node 2 public interface	Dell 1850 PowerEdge second internal network adapter (eth1)
Cluster Node 2 public static IP address	192.168.10.5
Cluster Node 2 hostname	node-b.localdomain

7) To save entered network adapters configuration press “NEXT”
8) Follow installation instructions until “Select software packages group” screen
9) Check software required packages. Attention: DO NOT select “Clustering” and “Cluster storage” because shipped with generic CentOS 5 distribution cluster oriented package contains error, and does not allow deploying cluster properly. Make sure that “yum” utility is in the list of installed packages.
10) Finalize installation. Security issues: do not enable SELinux and firewall. Default rules of SELinux and firewall blocks the intracluster communications. These features can be included into cluster system later. Customization of firewall rules is not within the scope of this guide; please see corresponding system manual pages and SELinux/firewall guides.
11) Installation manager will reboot cluster node system.

Repeat installation process on Cluster Node 2, specifying corresponding values for Node 2.

Cluster Solution installation

Required packages

RHCS software consists of several software packages. Some of them manages cluster system, others features CentOS 5 kernel to handle RedHat Global File System. List of RHCS required packages:

- gfs-utils Utilities for managing the global filesystem (GFS).
- gfs2-utils Utilities for managing the global filesystem extended (GFS2).
- gnbd GFS's Network Block Device.
- rgmanager Open Source HA Resource Group Failover for CentOS.
- cman The Cluster Manager.
- openais The openais Standards-Based Cluster Framework executive and APIs.
- iproute Advanced IP routing and network device configuration tools.
- kmod-gfs gfs kernel module.
- kmod-gnbd gnbd kernel module.
- luci Remote Management System - Management Station.
- ricci Remote Management System - Managed Station.
- modcluster CentOS Cluster Suite - remote management.
- OpenIPMI-tools OpenIPMI utilities and scripts from ipmitool.
- OpenIPMI Intelligent Platform Management Interface tools.
- OpenIPMI-libs Intelligent Platform Management Interface libraries.

RHCS and FIXEdge installation by automation script

1) Become root (super user), launch terminal window (if X Window environment used)
2) Create directory /root/RHCS (use mkdir utility with option /root/RHCS - "#mkdir /root/RHCS")
3) Download prepared package bundle located at http://b2bits.com/RHCS/RHCS-b2b-1.0.tgz to this directory. Use md5sum utility to check that archive is completely downloaded. Checksum of downloaded package must be:

   ```
   b02928d6356ec7741d5f18bed1dfc20f
   ```

4) Unpack it (use tar utility with options 'xzvf' – "#tar xzvf RHCS-b2b-1.0.tgz")
5) Download current FIXEdge server installation package and store it to /root/RHCS/FixEdge directory.
6) Put your FIXEdge server license file to directory /root/RHCS/FixEdge
7) Enter to /root/RHCS directory ("#cd /root/RHCS")
8) Start installation script by command "sh /root/RHCS/install install"
9) Follow installation script instructions.

References

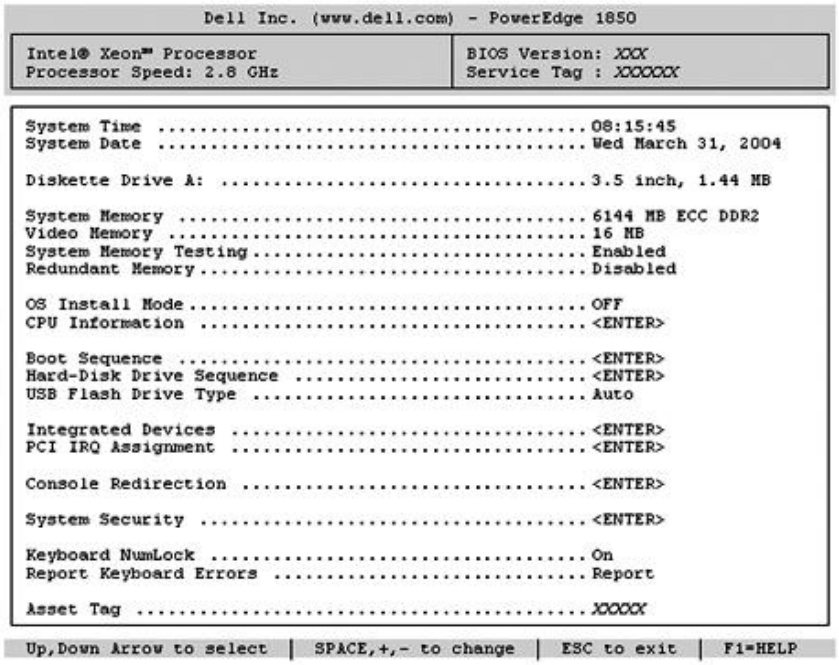
- A Reference Guide for Optimizing Dell™ SCSI Solutions.
  http://www.dell.com/downloads/global/products/pvaul/en/scsi_configuration_guide.pdf
- Dell™ PowerEdge™ 1850 Systems User's Guide.
  http://support.dell.com/support/edocs/systems/pe1850/en/UG/index.htm
- Dell™ PowerEdge™ Cluster SE500W Systems. Installation and Troubleshooting Guide.
  http://support.dell.com/support/edocs/systems/clusters/se500w/en/InT/se500wcb.htm
- Dell™ PowerEdge™ Cluster SE500W Systems. Platform Guide.
  http://support.dell.com/support/edocs/systems/clusters/se500w/en/PG/500Wpg.pdf
- Red Hat Cluster Suite. Configuring and Managing a Cluster.
  http://www.redhat.com/docs/manuals/enterprise/RHEL-3-Manual/pdf/rh-cs-en.pdf

Appendix A-1. Dell 1850 PowerEdge BIOS configuration.

1) Power on cluster node.
2) Press <F2> immediately after you see message:

```
<F2> = Setup
```

3) When entering the System Setup program, the main System Setup program screen appears:


Dell Inc. (www.dell.com) - PowerEdge 1850
Intel® Xeon™ Processor
Processor Speed: 2.8 GHz
BIOS Version: XXX
Service Tag : XXXXXX
System Time 08:15:45
System Date ..... Wed March 31, 2004
Diskette Drive A: ..... 3.5 inch, 1.44 MB
System Memory ..... 6144 MB ECC DDR2
Video Memory ..... 16 MB
System Memory Testing ..... Enabled
Redundant Memory ..... Disabled
OS Install Mode ..... OFF
CPU Information ..... <ENTER>
Boot Sequence ..... <ENTER>
Hard-Disk Drive Sequence ..... <ENTER>
USB Flash Drive Type ..... Auto
Integrated Devices ..... <ENTER>
PCI IRQ Assignment ..... <ENTER>
Console Redirection ..... <ENTER>
System Security ..... <ENTER>
Keyboard NumLock ..... On
Report Keyboard Errors ..... Report
Asset Tag XXXXX
Up,Down Arrow to select | SPACE,+,- to change | ESC to exit | F1=HELP

4) Please set Dell 1850 PowerEdge BIOS configuration options as specified in following table (not sufficient options are omitted):

Screen name	Option	Description	Value to set
Main	OS Install Mode	Determines the maximum amount of memory available to the operating system. On sets the maximum memory to 256 MB. Off makes all of the system memory available to the operating system. Some operating systems cannot install with more than 2 GB of system memory	OFF
Main	Boot Sequence	Determines the order in which the system searches for boot devices during system startup. Available options can include the diskette drive, CD drive, hard drives, and network	1. CD-ROM 2. SCSI HDD
Main	Hard-Disk Drive Sequence	Hard-Disk Drive Sequence lists installed adapter cards and devices in the order they will be initialized	1. Local SCSI HDD 2. Shared Storage SCSI HDD
Integrated Devices	SCSI Controller	Enables the integrated SCSI subsystem. This field displays only when RAID is not detected in the system	SCSI
Integrated Devices	Embedded RAID Controller	Selects between RAID Enabled, SCSI Enabled, or Off. The configurable options vary, depending on whether the optional ROMB key and memory are installed	SCSI Enabled
Integrated Devices	IDE CD-ROM Controller	Enables the integrated IDE controller. When set to Auto, each channel of the integrated IDE controller is enabled if	AUTO

Screen name	Option	Description	Value to set
		IDE devices are attached to the channel and the external IDE controller is not detected	
Integrated Devices	Embedded Gb NIC1	Enables or disables the system's integrated network adapter #1	Enabled without PXE
Integrated Devices	Embedded Gb NIC2	Enables or disables the system's integrated network adapter #2	Enabled without PXE
Console Redirection	Console Redirection	Sets the console redirection feature to Serial Port 1 or Off	OFF

When all options are configured – save configuration and reboot cluster node to enable configured parameters

Appendix A-2. PERC 4e/DC RAID adapter configuration.

1) Power on cluster node.
2) Press <Ctrl+M> immediately after you see message:

```
PowerEdge Expandable RAID Controller
Press <Ctrl><M> to run Configuration Utility
```

3) In PERC 4e/DC setup menu, navigate to Objects->Adapter. Set configuration parameters according the table below

Parameter	Value to set
FastInitiation	ON
RebuldRate	30%
Alarm Control	Enable alarm
Emulation	MASS STORAGE
Auto Rebuild	Enabled
InitiatorID	**8**/7 (**Cluster Node 1**/Cluster Node 2)
Cluster Mode	Enabled

4) Save configuration, reboot or power off Cluster node hardware to enable configured parameters

Appendix A-3. Dell PowerVault 220S disk drive configuration.

!Attention! Instruction doesn't cover case then PowerVault 220S storage is used for other purposes and already includes some logical drives. During new array configuration all previous configuration and logical drive data will be lost! Disk drive configuration should be processed only one time. Use Cluster Node 1 then PERC 4e/DC adapter is configured on it.

1) Power on Dell PowerVault 220S device
2) Power on Dell 1850 PowerEdge cluster node
3) Press <Ctrl+M> immediately after you see message:

```
PowerEdge Expandable RAID Controller
Press <Ctrl><M> to run Configuration Utility
```

5) Follow disk drive initialization scenario. Scenario legend (T – some action from user, such as navigate to menu or press key; M – displayed text, configuration program message)

- **RAID 5 level array setup**
- **T:** Configure->Clear configuration[ENTER]
- **T:** Configure->Easy configuration[ENTER]
- **M:** Easy Configuration – ARRAY selection menu
- **T:** Press [SPACE] key to select tree disks as a new raid array members
- **T:** Press [ENTER] to finalize disk selection
- **M:** Select Configurable Array
- **T:** Press [SPACE] to select array, window content should display "SPAN-1"
- **T:** Press [F10]
- **M:** Logical Drives Configured
- **T:** Make sure – new raid array type should be 5
- **T:** navigate to "accept" menu item and press [ENTER]
- **M:** Save Configuration
- **T:** Confirm configuration saving
- **Logical disk initialization**
- **T:** Navigate to "Initialize" menu item and press [ENTER]
- **M:** Logical Drives
- **T:** Navigate to "Logical drive 0" and press [SPACE] to select it
- **T:** Press [F10] to begin initialization process
- **T:** When "100%" of driver initialization is done press any key
- Accept changes and press [ESC] to exit from configuration program

Appendix A-3. Dell 1850 PowerEdge BMC controller configuration.

1) Power on Cluster Node
2) During boot press <Ctrl+E> immediately after you see message:

```
Press <Ctrl><E> to enter BMC configuration setup
```

3) Configuration parameters for Cluster Node 1:
   - **Main menu**
   - IPMI over LAN: ON
   - **"IPMI LAN" menu**
   - IP address source: STATIC
   - Ethernet IP address: 10.0.0.3
   - Subnet mask: 255.255.255.248
   - Default gateway: 10.0.0.1
   - VLan enable: off
   - **"User configuration" menu**
   - Administrator Account: Enabled
   - Admin account: toor_a
   - Password: enter any secured password, it will be used in fence device configuration
   - **"Host name" menu**
   - Host name string: node-a-ipmi

   Configuration parameters for Cluster Node 2:
   - **Main menu**
   - IPMI over LAN: ON
   - **"IPMI LAN" menu**
   - IP address source: STATIC
   - Ethernet IP address: 10.0.0.4
   - Subnet mask: 255.255.255.248
   - Default gateway: 10.0.0.1
   - VLan enable: off
   - **"User configuration" menu**
   - Administrator Account: Enabled
   - Admin account: toor_b
   - Password: enter any secured password, it will be used in fence device configuration
   - **"Host name" menu**
   - Host name string: node-b-ipmi
4) When configuration is done – press "ESC" and confirm configuration saving. Press "CTRL+ALT+DEL" after exiting from BMC configuration setup – it enables a new configuration parameters for IPMILan interface.